

PIPELINE

Wildlife Adapts to Change at Prudhoe Bay, Says Naturalist

Caribou found today in the North Slope region of Alaska were either born or raised with the Prudhoe Bay oil field under development or in operation, says naturalist Angus Gavin of Winnipeg. "The life of a caribou lasts ten to twelve years. Construction at Prudhoe Bay began in 1969, so these animals wouldn't know life without that field." Development does not seem to have interfered with their well-being, suggests the former Canadian General Manager of the conservation group, Ducks Unlimited. "Within a given year as many as 17 calves may be born in the developed oilfield area—some within 50 feet of the road!"

With over 25 years of his career devoted to life above the Arctic Circle, Gavin has been conducting studies since 1969 for Atlantic Richfield Company on the wildlife of Alaska's North Slope and ways to minimize the impact of the oil-field development in an area covering approximately 777 km² (300 sq. mi.) of tundra and permafrost at Prudhoe Bay. Oil was first discovered there in 1968 and, at the company's request, Gavin came out of retirement to monitor and report on the numbers, movements and habits of wildlife populations within the region, particularly caribou and waterfowl. Observations of other animal species, such as wolves, foxes, grizzly bears, moose, lemmings and birds of prey, were also made in conjunction with the caribou and waterfowl surveys.

Gavin presented his findings, illustrated by colour slides, on January 27 in Calgary to a group of 120 people from the environmental community, government, industry and the media. The presentation was organized by the Northern Pipeline Agency and Foothills Pipe Lines (Yukon) Ltd. as an opportunity to raise discussion on the questions of environmental protection and the impact of development in the region where the Alaska Highway gas pipeline will begin.



Caribou cross below oil pipeline near Prudhoe Bay, Alaska.

photo courtesy of Angus Gavin

"Like a lot of people with a conservationist background, I was apprehensive about the effects the Prudhoe Bay oil field would have on the wildlife in the area," he recalls. "But I decided to go with an open mind and forget everything I knew or thought I knew. I have been rather surprised with what we've observed and learned and continue to learn."

Each year towards the end of April, Gavin begins to monitor caribou populations as they move from their inland wintering grounds to calving grounds and summer range on the coastal plains of the North Slope. The surveys continue through summer and fall until the ani-

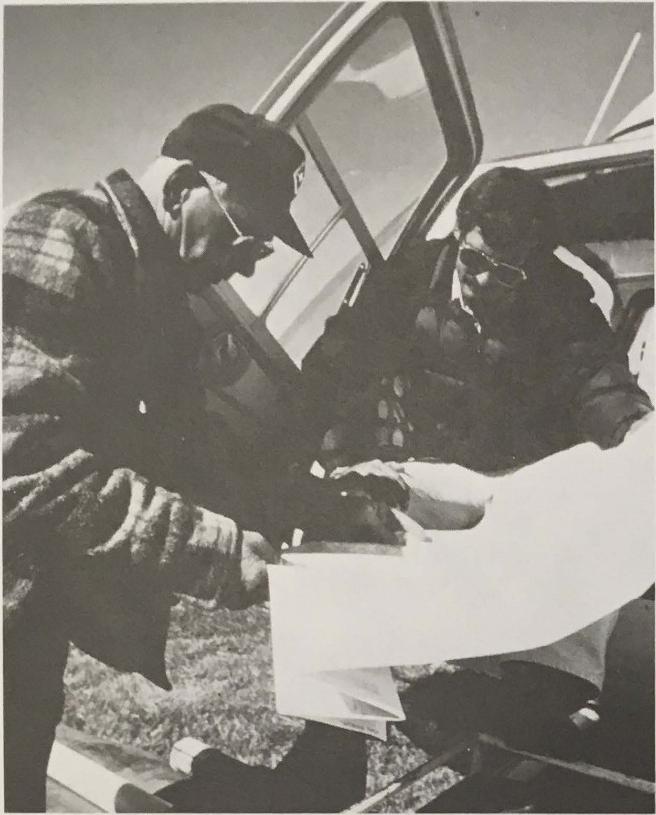
mals leave for their wintering quarters.

"We take our counts over the area lying between the Colville and Canning Rivers at least once a week, running our surveys on fixed routes and making as many as a dozen different transects," Gavin explains. "In this way we get the total number of animals in any given area and their movements from week to week."

These surveys also provide population ratios, including calving success, and comparative data between developed and undeveloped areas, he continues. "We want to know when these animals are usually within an area proposed for continued next page . . .

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Angus Gavin (left) was born and educated in Scotland and holds degrees in both zoology and engineering. In recognition of his work at Prudhoe Bay, he received the Governor's Conservation Award from the State of Alaska in 1980, and, in 1981, was presented the Outdoor Life Conservation Award by U.S. President Reagan.

future development so that disturbances created by drilling and construction activities can be kept to a minimum, especially during the calving season." Within the Prudhoe Bay oilfield proper, Gavin conducts his counts from the network of roads that intersect the field and from aerial surveys taken in conjunction with those done outside the development.

When development first began at Prudhoe Bay, environmentalists expressed concern that the aboveground portions of the Alyeska oil pipeline to Valdez, Alaska, would hinder caribou movements and prevent them from reaching their calving grounds, notes Gavin. However, from what he has observed within his area of study, which includes about 241 km (150 mi.) of the pipeline, "They wander back and forth without any difficulty."

Mosquitoes in the north pose the greatest threat to caribou, Gavin continues. He emphasizes that it is critical to the animals' well-being not to block their access to the deltas and points along the coast where they go to escape mosquitoes. "We've seen in the Prudhoe Bay oil field that they'll go anywhere to get

away from mosquitoes—below buildings supported by pilings, up against oilwells or on top of drill pads. They'll even try to get inside vehicles and often congregate around the compressor building which has eight generators operating at once and sounds like a '747' taking off!" Gavin says that, when under stress from mosquitoes, the animals do not seem to pay much attention to the noise from the compressor plant.

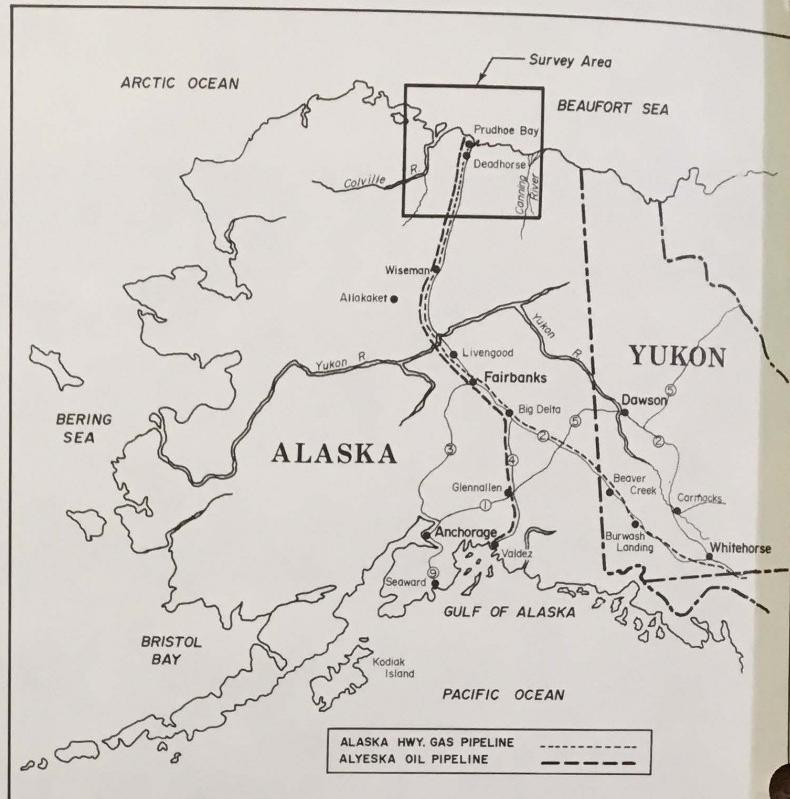
During the early years of his research, Gavin noted the caribou population migrating into his survey area dropped from a high of 20,000 in 1970 to a low of 2,500 in 1972. However, he maintains his studies indicate the decline was not linked to the oilfield development at Prudhoe Bay and construction of the pipeline and the associated haul road. It was part of a natural trend occurring throughout the Western Arctic Herd, which comprised up to 80 percent of the caribou in the Prudhoe Bay area, Gavin continues. When this herd began to experience several seasons of poor reproduction, disease, predation and over-hunting in the early 1970s, the number of animals coming to Prudhoe Bay was

sharply reduced, he explains. "That left us with a population of caribou mainly from the Central Arctic Herd, which still makes up the major portion using the Prudhoe Bay area today."

Although the pipeline was completed in 1977 and many of the major facilities are in place within the oil field proper, Gavin says considerable construction is still going on. "Despite the construction, caribou continue to calve within the field as they have done since development started in 1969," he observes. "The overall population of the Central Arctic Herd, which is the main contributor and user of this region of the North Slope, continues to increase. It has now reached a population of some 7,500," he remarks, "and anywhere between 50 and 2,000 animals remain along the coast throughout the year."

Dr. Tony Yarranton, Manager of the Northern Pipeline Agency's environmental group, says Gavin's experience with the Prudhoe Bay oil field, as well as surveys conducted by the Alaska Fish and Game Department, are useful for planning measures to mitigate the effects

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Pipeline Project Generates Strong Employment Interest Among Northern B.C. Natives

Interest in jobs on the Alaska Highway gas pipeline was expressed by over 80 percent of the 1,200 status and non-status Indians and Metis people interviewed in a native employment skills survey conducted last fall throughout northeastern British Columbia. Organized by the Canada Employment and Immigration Commission (CEIC), in co-ordination with the local Native Friendship Centres, the survey is the first to measure the level of interest among northeastern B.C. natives in participating in resource development projects scheduled for the region, the skills they possess and their training needs.

When compared with the other projects listed in the questionnaire, including northeast coal, hydro and oil and gas exploration, the pipeline scored the highest in terms of definite employment interest, says Anne Banford, CEIC Employment Counsellor based in Fort St. John and Field Co-ordinator of the survey. "This may well be related to the fact that the pipeline has had a fairly high profile over the last few years," Banford suggests, referring to the public hearings held in late 1979 on the Northern Pipeline Agency's proposed socio-economic and environmental terms and conditions for the northeastern B.C. portion of the project.

The pipeline is physically more accessible to a greater number of local residents, continues Banford, since the route stretches right through the northeastern corner of the province, following the Alaska Highway. "I think people are being realistic. When broken down by area, 82 percent of those interviewed from the Blueberry Band showed a strong interest, as did 78 percent from Lower Post. Further away from the route in Chetwynd, 48 percent said they were definitely interested in pipeline work."

Survey result of need for details on native skills and interest in training and jobs

Banford explains the survey grew from a need for more detailed information on the native people in northeastern B.C. in terms of their skills and training and employment aspirations related to the major development projects proposed for the area. "By talking with employers, government people and native groups, we realized there was a concern for local native hire, but to fulfill this commitment more information was needed on the native population."

As a result of workshops on native participation in resource development held last June in Dawson Creek and Prince George by the Department of Indian Affairs and Northern Development (DIAND), it was agreed that DIAND and CEIC would develop the format for an employment skills survey to be conducted at the band level by local native people. "After consultation with the native organizations and with the companies

to make sure we'd get the kind of information they need, we came up with a 91-question survey," Banford explains. "A total of 24 native interviewers from 10 different locations was hired." Following training sessions, the survey began in late September and wrapped up in early December. Banford estimates that the potential native workforce in the area is approximately 2,500, almost half of which was interviewed.

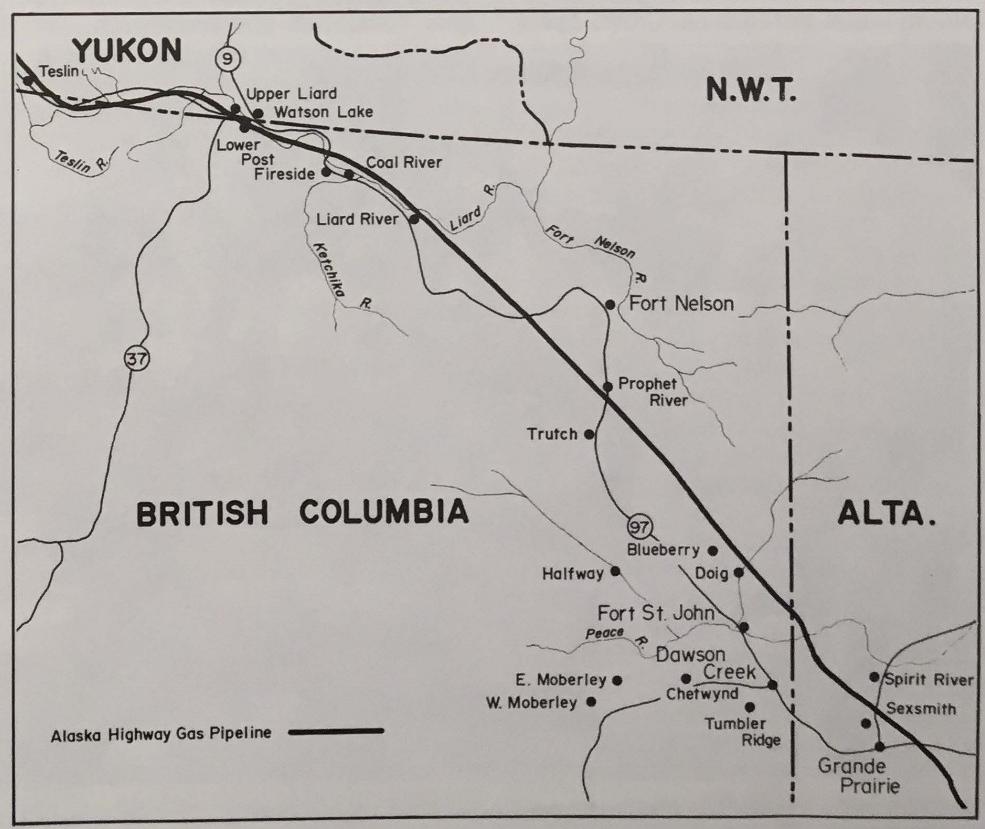
She comments on the "amazingly youthful" participation in the survey. "Out of the working age bracket between 15 and 65 years, 47 percent of those people interviewed are between 15 and 25 years of age," she notes. "We also compiled household lists of those interviewed which showed a high concentration of youth, with 37 percent of the people listed under the age of 15." Banford adds that almost 50 percent of the survey participants are women.

Almost everyone interviewed expressed an interest in training programs, notes Banford, which indicates a desire for skilled positions that can be applied to future work.

NATIVE EMPLOYMENT SKILLS SURVEY

Northeastern B.C.
September - December, 1981

Proposed Development Project	Very Interested	Possibly Interested	Not Interested
Hydro	49.6%	26.0%	24.4%
Northern Pipeline	60.4%	21.5%	18.0%
Northeast Coal	45.1%	23.3%	31.6%
Oil and Gas Exploration	48.1%	24.2%	27.7%



News in Brief

During two weeks of public meetings, which began February 8 in Yukon communities along the Alaska Highway gas pipeline route, Foothills Pipe Lines (South Yukon) Ltd. listened to comments from local residents on the first three drafts of a series of plans prepared for the project. The drafts under review outline the company's plans for providing project information to affected communities and groups before and during construction, a transportation and logistics plan for moving material and manpower, and details on the size, scheduling and location of work camps.

Foothills (South Yukon) developed the draft plans in consultation with the Northern Pipeline Agency, the Yukon Territorial Government and the Yukon Advisory Council.

On a helicopter survey made in early February, wildlife biologists from Foothills Pipe Lines (South Yukon) Ltd. and the Northern Pipeline Agency conducted a census of moose and caribou near the route of the Alaska Highway gas pipeline between Whitehorse, Yukon, and Fort Nelson, British Columbia. An approximate total of 200 moose was observed, with the majority concentrated in the burned out areas of Swift River/Mount Hazel and Spencer Creek. About

35 caribou were counted, mostly in small groups throughout the Big Creek and McKinnon Lake region of British Columbia. The company will forward detailed results of the survey to the Agency for review by the end of March.

Foothills (South Yukon) conducts periodic surveys of wildlife to assist with the environmental protection planning for the pipeline project. Under the Agency's environmental terms and conditions, the Foothills Group of Companies must schedule construction to minimize disturbance to wildlife populations during sensitive periods of their life cycle such as breeding, or in winter when food is less accessible and movement is restricted by snow.

The Northern Pipeline Agency Annual Report 1980-1981 was tabled on February 9, 1982, in the Canadian Senate by Sen. H. A. (Bud) Olson, Minister responsible for the Agency, and the following day in the House of Commons by the Hon. Marc Lalonde, Minister of Energy, Mines and Resources. As required under the *Northern Pipeline Act*, the report outlines the Agency's operations, activities and financial statement for the fiscal year. Copies are available at the Agency's offices in Ottawa, Calgary, Vancouver and Whitehorse.

The United States Federal Energy Regulatory Commission (FERC) has scheduled a conference for March 16 in Washington, D.C., to receive an update from project sponsors on financing for the Alaskan segment of the Alaska Highway gas pipeline. The conference will be presided over by FERC Commissioner Anthony G. Sousa, who assumed responsibility in early January for FERC's involvement with the pipeline project. Discussions will also focus on matters subject to consideration by the FERC, such as pipeline design, the Prudhoe Bay gas conditioning plant, tariffs to be charged for use of the pipeline system and the revised cost estimate of \$8.55 billion U.S. submitted last November by Northwest Alaskan Pipeline Company. The new figure is in 1980 dollars and is not escalated to include interest or inflation.

The FERC has already held two technical conferences in 1982, dealing with the reasons for the new cost information—a \$373.3 million proposed increase over the October 1980 estimate of \$8.19 billion. The revision includes increases resulting from highway repair costs, socio-economic impact studies and schedule and design modifications.



Photo by Richard Hartmier, Foothills (South Yukon)

Members of the Kwanlin Dun Band in Whitehorse are briefed by Foothills (South Yukon) representatives on socio-economic plans for Yukon.

Profile: The Hon. Mitchell Sharp, Commissioner

For the Hon. Mitchell Sharp, being Commissioner of the Northern Pipeline Agency hasn't turned out at all as he expected.

Sharp's appointment in May of 1978 as the senior public official in charge of the newly established Agency followed a long and varied career in both the public and private sectors. Having first come to Ottawa from Winnipeg in 1942 as a grain trade analyst on loan from James Richardsons and Sons, he stayed on to become Deputy Minister of Trade and Commerce in 1957 under the legendary C. D. Howe and later his Conservative successor.

In 1958, he left the public service to become a Vice-President of Brazilian Traction (predecessor to Brascan). Defeated in a first bid for a House of Commons' seat as the Liberal candidate for Toronto-Eglinton in 1962, he was elected as Member of the riding in the general election of 1963. His appointment as Minister of Trade and Commerce in the Pearson government that came to office in that election was followed by a series of other senior portfolios. In 1965 he became Minister of Finance, in 1968 Secretary of State for External Affairs, and in 1974 President of the Privy Council and Government Leader in the House of Commons.

In the fall of 1976, Sharp resigned from the Cabinet to become a backbencher, intent on leaving active politics before the next election. Over the months that followed, a number of proposals for alternative service were proposed to him by the Prime Minister, none of which he found particularly attractive. "One day," Sharp recounts, "the Prime Minister said, 'How would you like to be Commissioner of the Northern Pipeline Agency after it is established?' This did interest me very much because, having come from Winnipeg, I was familiar with western problems and attitudes and I had played quite a leading role in the political decisions when the building of the Trans-Canada PipeLine was being considered by Parliament."

Returning home to Ottawa from a trip to Europe on May 1, 1978, Sharp received a message at the airport to report immediately to the Clerk of the House of Commons to resign his seat and the following day was appointed Commissioner of the Agency.

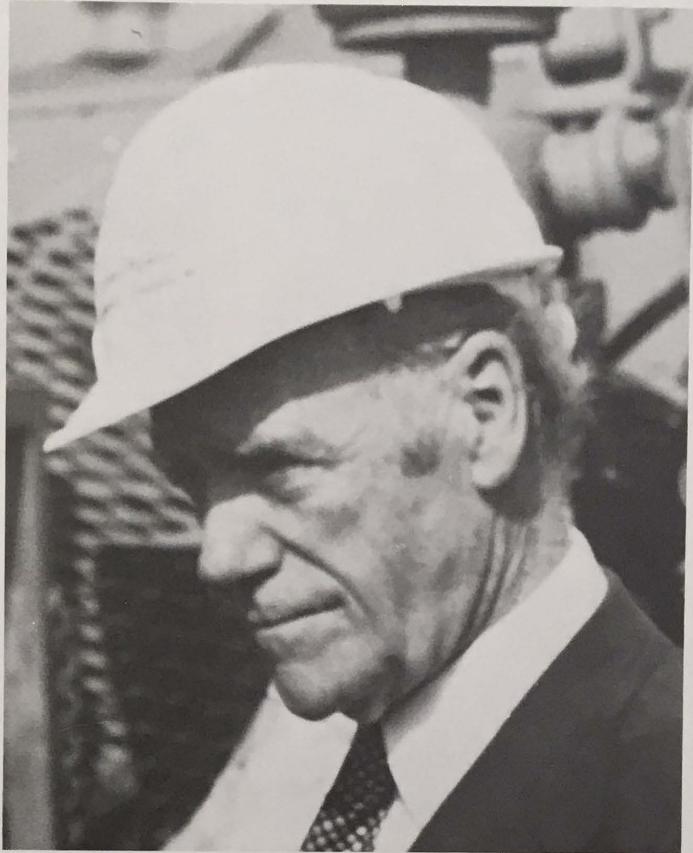
"When I took on the job, I expected that I would be involved for perhaps a year or two in setting up the machinery for regulating the pipeline," he recalls. "It did not occur to me that I would spend more than three years playing a part in trying to bring together the many participants—the two federal governments, the pipeline sponsors in both countries, the Alaskan gas owners, and so on—in order to get the project under way. In retrospect, since this did turn out to be my major activity, my experience as a politician and my contacts in both Canada and the United States proved to be very important in enabling me to carry out that role."

The agreement signed by the Cana-

dian and U.S. governments in 1977 anticipated that the entire system would be in operation by January 1983, while the outlook currently is for completion of the pipeline in 1986-87. Sharp considers there are a number of causes for this delay, not least among them a declining sense of urgency in the United States.

"It must be remembered," he says, "that when Canada and the United States undertook to consider joint construction of a northern gas pipeline, there was an expectation that the international energy situation would continue to be of crisis proportions. In fact, by the time the bilateral agreement was signed between the two countries and implementing legislation approved, the sense of urgency was no longer present and did not begin to revive again until the very big jump in oil prices in 1979-80."

Another time-consuming factor was the regulatory process itself, in the Commissioner's view. The traumatic experience connected with the building of the Alyeska oil pipeline in Alaska in



The Hon. Mitchell Sharp, Commissioner

terms of delays, soaring costs, and adverse social and environmental impacts had a jarring impact on people in both Canada and the United States. It was because of this experience, he notes, that both countries took considerable pains to identify in advance potential socio-economic, environmental and technological problems associated with the proposed Alaska Highway gas pipeline and to determine ways of overcoming or mitigating them.

The establishment of the Northern Pipeline Agency in Canada and the Office of the Federal Inspector in the United States to oversee the planning and construction of the pipeline in each country was one mechanism that was adopted in an effort to minimize adverse impacts and at the same time, expedite planning and construction of the project, the Commissioner points out. He acknowledges that in retrospect there was probably excessive optimism at the outset, particularly in the United States, about the effectiveness of the regulatory

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processes that had been established. "All great projects have experienced these delays simply because the regulatory process has not been devised to deal expeditiously with all of the many concerns that have come to surround them," he says. "By contrast with the United States, our regulatory procedures in Canada are relatively simple and do tend to work reasonably effectively."

The Commissioner considers that a further factor impeding progress on the project involved some of the governing provisions laid down by the President in his Decision and Report to Congress in September 1977, provisions which were ultimately incorporated in U.S. legislation with their adoption by the Senate and House of Representatives. "In retrospect, I suppose it was naive, for example, to expect that the Alaskan segment of the pipeline could be financed without the participation in the project of the producers of the gas at Prudhoe Bay," he observes. "The President's decision provided for their help in financing the line, but when this issue was raised in concrete fashion the producers insisted on some share in ownership in exchange for providing part of the required debt capital."

Attitude of gas producers towards project changed

In the Commissioner's view, one of the more interesting developments to occur over the time since he first became associated with the Agency was the changing attitude of the producers of the Prudhoe Bay gas toward the project. Initially, he found, they were quite lukewarm about the undertaking for a variety of reasons. These included their initial disappointment over the rejection of the competing Canadian Arctic Gas project, which they supported, their belief that the design and engineering work done by the sponsors of the Alaska Highway project was inadequate, and the lack of any sense of responsibility for the latter undertaking because of the prohibition placed on their participation in its ownership and management. "The turning point came a couple of years ago when the sponsors of the Alaskan pipeline and the producers of the gas in Alaska decided to join together in spending half a billion dollars or more to complete the engineering and cost estimates for the

pipeline and conditioning plant."

As the Commissioner of the Northern Pipeline Agency, Sharp had been closely involved in the discussions with members of the Carter Administration and Congressional leaders with respect to the expeditious completion of the entire project that led to the eventual decision of the Canadian government in July 1980 to authorize first-stage construction of the Western and Eastern Legs of the pipeline. With the election of President Ronald Reagan in November 1980, the Commissioner undertook a new round

priority. While all the participating companies involved recognized that this continued to be a major challenge, he points out that none had withdrawn because it considered it insurmountable.

Associated with the financing of the project is the task of establishing the marketability of the gas in southern U.S. markets. "From the outset," Sharp notes, "it was realized there would be a marketing problem in the early years because of the initially high cost of the Alaskan gas. This is why provision was made for rolling in the price of that gas

Anxious to ascertain new U.S. Administration would follow through commitments to Canada

of discussions with members of the new Administration and the new Congress.

"Since I had been at the centre of negotiations with the Carter Administration when commitments were made which enabled the Canadian government to authorize construction of the pre-build sections of the pipeline," he says, "I was anxious to ascertain that the new Administration would follow through. It was natural enough at the beginning that members of the Administration were not too well informed on the outstanding issues. After they became aware of the importance of the project, however, they decided to support it strongly and not only to follow through on commitments made to Canada, but to include in the package of waivers sent to Congress other measures that will help to facilitate financing of the project."

Sharp found himself impressed by two aspects of the recent debate in Congress that led ultimately to approval of the package of legislative waivers proposed by the Reagan Administration. "The first," he says, "was the widespread understanding that this was a joint project and the earlier commencement of first-stage construction of the southern segments had been authorized by Canada on the strength of assurances of the Administration and Congress. The second point was that during the debate there was hardly any reference to other energy matters in dispute between our two countries, with the pipeline being considered on its own merits."

In the months which lie ahead, the Commissioner sees the completion of financing for the project, particularly in Alaska, as being the concern of highest

with other domestic gas supplies. I have been impressed, however, by the confidence expressed with respect to other means also available to meet this short-term problem."

The Commissioner recognizes meeting the current target for completion of the pipeline system by 1986-87 will not be easy. To do so, it will be necessary to begin placing firm orders for components for the gas conditioning plant at Prudhoe Bay by the middle of this year so deliveries can be made during the limited period of open sea in the Beaufort during the summers from 1983 to 1985. For such contracts to be let, in turn, requires that financing of the project has been established and the regulatory process essentially completed with the issuance of a final certificate by the U.S. Federal Energy Regulatory Commission. "The timing to meet that schedule is obviously very tight," he points out.

Despite all the delays and setbacks encountered by the Alaska Highway Gas Pipeline Project to date, what stands out in Sharp's mind in looking back over the whole process has been the "high degree of co-operation and co-ordination that has prevailed throughout, not only between the Canadian and United States governments, but also between the legislatures of the two countries." As the first joint pipeline project in which Canada and the United States have engaged, it has presented problems of a kind they have never had to deal with before in their long relationship. "What is important," he emphasizes, "is that at each stage in the process the action required to overcome those problems has been taken."

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on wildlife of natural gas production and construction of the buried Alaska Highway gas pipeline. "I agree with Gavin's basic conclusion that construction of the oil field was not an environmental disaster as some people had originally feared."

However, because Gavin's studies began in 1969, Yarranton continues, he has no data on caribou numbers and calving densities prior to disturbance by development or by the preliminary exploration and seismic work which was done in the mid-1960s. "Therefore he can't estimate exactly how much effect there was on this particular animal population," suggests Yarranton. "The fact that calving still occurs in the area doesn't mean there has not been an effect on numbers or densities."

Gavin has been carrying out studies on waterfowl, similar to the caribou surveys, to determine the effect oilfield operations might have on numbers, distribution, migrations and the use of the Prudhoe Bay region for breeding and rearing of young. Gavin says minor fluctuations were observed in overall waterfowl populations since 1969, as well as some shifting in nesting densities from one area to another, particularly in black brant geese. Some colonies of these birds have returned to their original nesting sites after a year or so, he continues.

"There is no doubt that the high level of human activity near some of these colonies was to an extent instrumental in causing some of the shifts," he wrote in his report, following his tenth year of research. "We also have noted that



photo courtesy of Angus Gavin
A common eider duck used this experimental nesting site, created with a rubber tire.

some colonies have moved although they were not in any way disturbed by any of the activities connected with the oil field." Gavin says his studies show the overall nesting population of brant geese within the survey area has remained remarkably stable.

Gavin suggests that certain species of waterfowl, such as the white-fronted goose and the lesser Canada goose, have adapted well to human activity in the region and have shown population increases over the years. He refers to an "oasis" condition throughout much of the oilfield area and along the haul road created by dust particles from construction, which retain the sun's heat and cause the ground surface to thaw more rapidly than in adjacent areas. This has attracted many birds to Prudhoe Bay and at a much earlier date than in other regions across the Slope, Gavin says.

"The influx of birds is tremendous. Tens of thousands of geese come in — many more than we would normally get

without the oil field," comments Gavin. To accommodate the numbers of waterfowl concentrated in the Prudhoe Bay area during spring, Gavin has experimented with the use of artificial nesting "islands" or platforms of straw, gravel or even rubber tires. "I did this with Ducks Unlimited," he explains, "and it's working well at Prudhoe Bay."

Gavin points out the oil field also attracts a considerable number of foxes. "At least 15 fox dens are located within the field and are occupied every year," he reports. When lemming are scarce, these animals turn to raiding nests and hunting young birds, he notes. "Sometimes 75 to 80 percent of the nests in certain areas are destroyed by foxes."

As carriers of rabies, foxes can be a nuisance to man, Gavin continues. "On three occasions we've had to let trappers come in to take a number of foxes to protect field personnel from rabies." He emphasizes the importance of proper garbage disposal practices and strict care not to feed wild animals exercised by the staff of Atlantic Richfield Company.

"There is always some disturbance to the wildlife in an area undergoing exploration or development," Gavin points out, "although the effect may not be drastic or long-term." Most animal species adapt readily to changing environmental conditions, he says. "Birds, now accustomed to the Prudhoe Bay field, nest all over and caribou drop their calves within sight of the rigs. They are raised with that in place."

To Gavin, the greatest potential impact on the wildlife at Prudhoe Bay would occur if the haul road were opened up to public access. For the time being, the area is buffered from the outside, he says. "No hunting whatsoever is permitted and the haul road is restricted to commercial traffic."

Gavin recognizes the cumulative or gradual effect that continued exploration and development would have on wildlife in terms of loss of habitat. "It is hard to speculate what may happen over the next 20 or 30 years," he remarks. "All we can do is say, 'All right, we're going in there and we'll do the best we can to restrict certain activities so as not to eliminate the animals. We may disrupt them for a certain period of time, but not to any lengthy or harmful extent.'"

Tony Yarranton of the Agency notes
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Caribou beside operating drill rig in Prudhoe Bay oil field.

photo courtesy of Angus Gavin

Measures to Prevent Pipeline Fractures Approved by Agency

The Northern Pipeline Agency approved on January 26, 1982, methodology and measures developed by the Foothills Group of Companies to address the possible occurrence of fractures in the mainline sections of the Alaska Highway gas pipeline in Alberta, northeastern British Columbia and Yukon.

Outlined in a report on fracture control methodology, these measures incorporate the results of the company's burst test program on 1 219-mm (48-in.) and 1 422-mm (56-in.) diameter steel line pipe. The fracture control design developed by Foothills (Yukon) goes beyond the scope of the tests, notes Michael Stanistreet, the Agency's Manager of Materials Engineering. "The company's approach is prevention-oriented."

Between December 1979 and April 1981, Foothills (Yukon) carried out six burst tests at its facility near Rainbow Lake in northwestern Alberta to determine the fracture arrest capabilities of large-diameter pipe under operating conditions similar to those planned for the mainline sections of the pipeline. The Agency approved the final report prepared by Foothills (Yukon) on the burst test program earlier in January.

"The tests confirmed the company's predictions that pipe produced in accordance with its proposed specifications has sufficient toughness to contain and stop a fracture by itself," says Stanistreet. Successful completion of the burst test program answers concerns expressed by the National Energy Board (NEB) as a result of the 1976-77 hearings on the application by Foothills (Yukon) for the license to build the pipeline, he remarks. Since the largest-diameter gas pipelines in Canada at that time were 1 067-mm (42-in.), the NEB required the company to perform a series of tests to determine how effectively the larger pipe sizes would halt a fracture and whether it may be necessary to install devices called crack arresters.

Under the provisions of the *Northern Pipeline Act*, the Agency was authorized to monitor and approve the burst test program and to approve the fracture control design features of

the line pipe and components such as valves and fittings. Stanistreet explains, "This is further specified in the Agency's Technical Orders, issued in January 1979, which require the company, as a precondition to approval of the fracture control design, to demonstrate the likelihood of fracture arrest of large-diameter pipe under the most critical operating conditions anticipated." The outcome of the burst tests was considered as part of the fracture control design which, in turn, forms part of the pipeline system's overall detailed engineering design, also subject to Agency approval, he adds.

"What you do to make sure you never get a fracture in the line is a far more important consideration than stopping one!" remarks Stanistreet. For this reason, Foothills (Yukon) plans to procure pipe of a high toughness level. Toughness refers to the pipe's ability to accommodate strain and absorb energy before fracturing. The idea is to ensure the pipeline is operated in a "leak-before-break" condition, according to the recently approved report on fracture control methodology.

The report also predicts that, in the event a fracture propagates, the fracture length would probably be of limited extent. These predictions are based on conservative assumptions and "worst case" operating conditions of pressure and temperature in combination with data on toughness distributions in previous productions of pipe. Toughness distribution refers to the different values of toughness within a given run of pipe by the mill. "The toughness distributions received from the mills and the distribution of tough pipe in the pipeline are matters the Agency will continue to monitor," Stanistreet notes.

Once the Agency, in consultation with the NEB, approved the fracture control design, other matters came under review. These include the engineering specifications, which were approved by the Agency in early February, covering requirements for the manufacture, inspection and testing of steel line pipe and fittings for the project.

continued . . . Wildlife Adapts to Change

that, since Gavin's survey area is confined to the actual oil field and adjacent proposed fields, he has no information on the effects of the pipeline and haul road further south. "He's looking at the northern end of the pipeline where the oil field is developed and usually there's more impact from the construction and use of the corridor." Since the Alaska Highway gas pipeline will follow an established route, its effect will be reduced, Yarranton points out.

Ken Ambrock, the Agency's environmental scientist in charge of wildlife, agrees with Yarranton that the introduction of a new road probably has more impact on wildlife than the actual pipeline because of increased traffic, access and human carelessness with food and

garbage. "We've learned from the Alyeska line that carnivore/human problems are real," Ambrock explains. "Over 300 bear incidents occurred along the haul road and many animals had to be shot by the Alaska Fish and Game Department." Ambrock adds that Northwest Alaskan Pipeline Company, builders of the Alaskan segment of the Alaska Highway gas pipeline, has documented the information as part of a recommended carnivore control program.

"There are a number of different professional approaches and points of view on the question of environmental impact," observes Tony Yarranton. "There's something to be said for them all, Gavin's is one approach and we should look at it in this context."

Pipeline

The Northern Pipeline Agency was created by Parliament in April, 1978 to oversee planning and construction of the Alaska Highway gas pipeline project in Canada. Inquiries or suggestions regarding the Agency's publication, *Pipeline*, may be directed to:



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